

A STUDY OF THE NORTH AMERICAN GENUS  
MEGARAFONUS CASEY

(Coleoptera: Pselaphidae)

R. O. SCHUSTER AND G. A. MARSH

The genus *Megarafonus* was proposed by T. L. Casey in 1897 for the single species *M. ventralis* from northern Oregon. A second species, *M. fundus*, was described by Park in 1943 from southern Mexico, discontinuously extending the range by nearly 2100 miles. As a result of newly acquired material, three additional species are included in the genus, two from Oregon which correspond with Casey's original generic diagnosis, and one from north central California which digresses markedly in the male genitalia and other pertinent structures.

In view of some external divergences and the disjunct geographic area, permission to dissect the type of *M. fundus* was requested of Dr. Park. He kindly agreed, and we owe him a sincere debt of gratitude, as the results confirmed suspected genitalic divergence from that of *Megarafonus s. str.* Dr. Park is aware of and in agreement with our treatment of the genus.

The genus now extends from Alaska to Mexico with three areas of differentiation, each represented by a newly proposed subgenus. Further discussion of these areas and representative species will be considered within each species group.

The morphological characters which appear at present to be of generic rank and partially illustrated in figures 1 and 2 are as follows: (1) body pubescence mostly short, but with some long, curved setae; (2) head with two vertexal foveae not connected to frontal sulcus; (3) frontal sulcus open between antennal bases; (4) antennae of eleven segments in both sexes, third segment small, club indistinct, of three segments; (5) maxillary palpi of four segments; (6) abdomen in both sexes of five visible tergites and seven visible sternites; (7) mesocoxae contiguous, coxal cavities not confluent; (8) metacoxae contiguous; (9) two, large, equal tarsal claws.

The following key will separate two related genera, *Caccolpectus* and *Sonoma*, which could possibly be confused with *Megarafonus* and includes the proposed subgenera.

- |   |                             |
|---|-----------------------------|
| 1. Tarsi with single claw.....  | <i>Caccoplectus</i>         |
| Tarsi with two equal claws.....   | 2                           |
| 2. Frontal fovea (sulcus) not extending between antennal tubercles .....  | <i>Sonoma</i>               |
| Frontal fovea (sulcus) extending between and separating antennal tubercles .....  | 3                           |
| 3. Cervix lacking setae or pubescence; base of male genitalia less than one-third total length, with median longitudinal suture on dorsal surface.....  | <i>Megarafonus, s. str.</i> |
| Cervix with setae or pubescence; base of male genitalia greater than one-third total length, median longitudinal suture of dorsal surface obsolete..... | 4                           |
| 4. Cervix with collar of monaxial setae, frontal sulcus nude; base of male genitalia nearly one-half total length; parameres void of apical setae.....  | <i>Nanorafonus</i>          |
| Cervical and frontal sulcus filled with frosted squamose pubescence; base of male genitalia one-half total length; parameres with apical setae.....     | <i>Nafonus</i>              |

#### SUBGENUS MEGARAFONUS Casey

To this subgenus are restricted those species of *Megarafonus*, *sensu lato*, which have a nude frontal sulcus and cervical area. Also, the male genitalia have a small base, less than one-third the total length and a well developed median dorsal suture.

They occur within the moist coastal conifer forests extending from northwestern California into southern Alaska and may occupy the entirety of this range, being found at both extremes. *M. ventralis* has been recorded from southern Alaska and northern Oregon and will probably occur wherever suitable environments exist between these locations. Two new species are from northwestern and south coastal Oregon, and females of an as yet unidentified species have been taken in Del Norte County, California. It is unlikely that this subgenus will occur much further south in California.

A critical analysis of some twenty external features yielded no characters suitable for species recognition. Therefore, it has been necessary to recognize species of this subgenus on the basis of strikingly different divergences of the asymmetric male genitalia which assume genitalic configurations as indicated in figures 10-14.

As can readily be seen, the asymmetry for any single species,

with the exception of *M. ventralis*, is either to the left or to the right using characteristics of the base for orientation. Furthermore, the possibility that the median lobe may rotate at the point of juncture on the base and thus account for a false sinistral or dextral condition is eliminated since the median lobe is rigidly fused to the base.

**Megarafonus (Megarafonus) lentus** Schuster and Marsh, n. sp.

*Male*.—Head 0.43 mm. long  $\times$  0.48 mm. wide; pronotum 0.51 mm.  $\times$  0.61 mm.; elytra 0.61 mm.  $\times$  0.73 mm.

Testaceous; dorsoventrally compressed; facies and proportions of parts as illustrated in figure 1; vestiture mainly short, dense, but with occasional long, curved setae. Head with large eyes, six or seven facets visible from above; two, small vertexal foveae behind posterior margin of eyes; median frontal sulcus (fovea) open anteriorly, widest at center; antennae of eleven verticillate segments, 1.0 mm. long; maxillary palpi of four segments; ventral surface of head without obvious sexual modification. Pronotum with two large foveae at basal angles, and two small basal and one median fovea at the apices of a nearly equilateral triangle, the median within a larger triangular depression. Elytra apparently connate, each elytron with about four major foveae; subhumeral fovea and epipleural sulcus lacking; wings absent. Abdomen of five visible tergites, the first four with lateral margins, the last two with noticeable spiracular pits; seven sternites, the second, third, and fourth with an anterior transverse sulcus, the sixth distally emarginate, the seventh a slightly asymmetric penal plate with rounded apex (fig. 4). Legs simple. Genitalia as illustrated (fig. 10).

*Holotype male* was collected at SEASIDE, CLATSOP COUNTY, OREGON, April 7, 1955, by Vincent D. Roth. Paratype males were collected by Mr. Roth as follows: one male, Seaside, same data as for holotype; two males six miles east of Buxton, Washington County, Oregon, April 6, 1955, and one male Saddle Mountain, Clatsop County, Oregon, June 5, 1955.

The holotype is deposited in the California Academy of Sciences, one paratype in the collection of Dr. Orlando Park, the remaining paratypes in the collection of the California Insect Survey.

The males of this species, as previously indicated are seemingly separable only on the basis of the male genitalia and specifically, the median lobe. The divergence of the median lobe would indicate that *M. lentus* is most distantly removed from its congeners. However, the difference in this structure is not so great as to obscure the relationship to *M. ventralis*. External characters which eventually may be of some diagnostic value

when the range of variation becomes established include the chaetotaxy of the labrum and seventh sternite as well as the relative positions of the elytral fovea. The females of this species have not as yet been associated with the males. However, they differ from the males by having a simple, non-emarginate sixth and apically emarginate seventh ventral abdominal sternite.

MEGARAFONUS (MEGARAFONUS) VENTRALIS Casey

*Megarafonus ventralis* Casey, Ann. N. Y. Acad. Sci., IX, p. 550.

This species was excellently considered in the original description. It is separable from *M. lentus* on the basis of the male genitalia (fig. 13).

The known records for this species are as follows: Alaska, Massett, Queen Charlotte Island, Rev. Keene. Oregon, Portland, Hubbard and Schwarz; Buxton, Washington County, V. D. Roth.

Unlike the other species of *Megarafonus s. str.*, which have but one condition of asymmetry, *M. ventralis* exhibits both sinistral and dextral male genitalic forms within a single species population. This anomaly is further discussed here as pending further investigation it may well apply to all species of this subgenus.

Three males of *M. ventralis* from Buxton, Washington County, Oregon, yielded both genitalic forms, two in which the asymmetry is to the left, and one, a mirror image, in which the asymmetry is to the right.

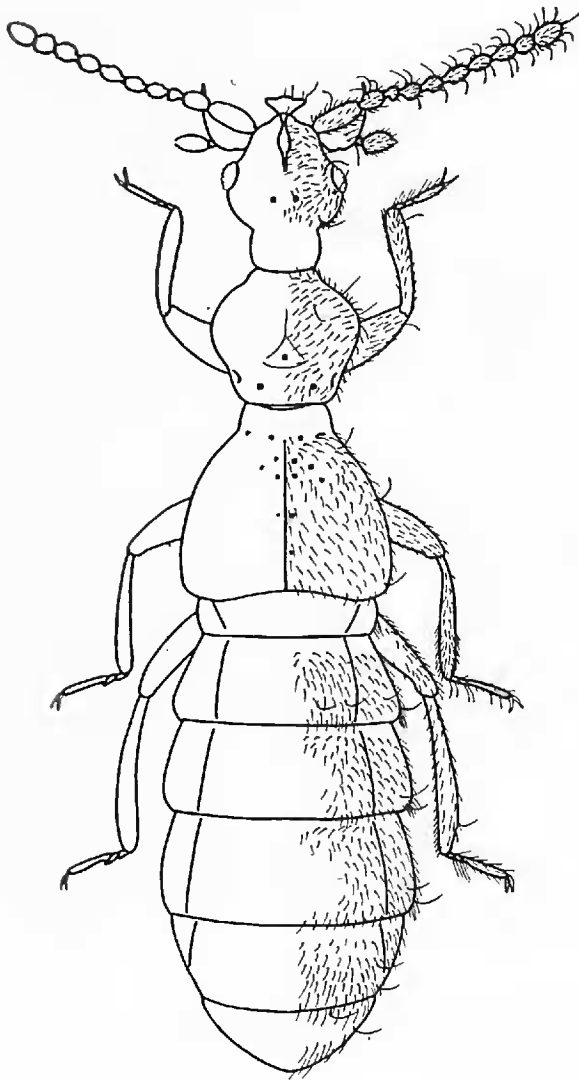
There is the possibility that the underlying cause for the development of mirror images in the genitalic structure could be a species isolating mechanism. At present, however, we prefer to postulate genitalic variability with one form possibly sterile, instead of sympatric sinistral and dextral species.

In a specimen from Gates, Marion County, Oregon, the genitalic structure (fig. 11) is comparable to *M. ventralis* (fig. 13) but differing mainly in the greater arcuation of the left paramere and median lobe. The degree of difference is not so great that it may not be considered to fall within the probable range of variability of *M. ventralis* even though males of *M. ventralis* from three other localities are rather constant in the shape of this structure.

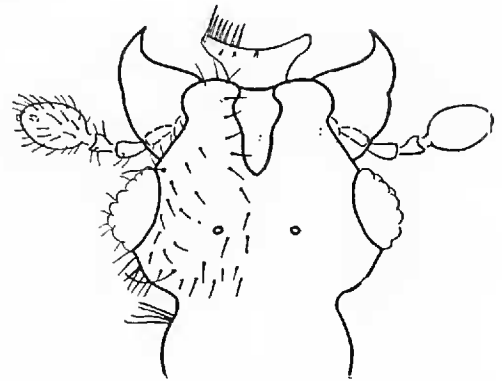
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EXPLANATION OF FIGURES

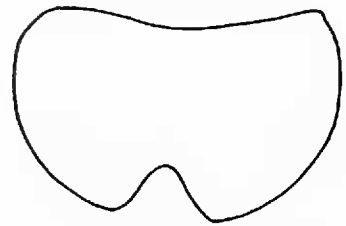
Fig. 1, dorsal view, male. Fig. 2, head capsule, dorsal view, male. Fig. 3, sixth sternite, male. Fig. 4, seventh sternite male. Fig. 5 seventh sternite, female. Figs. 6, 7, dorsal and lateral views, male genitalia.



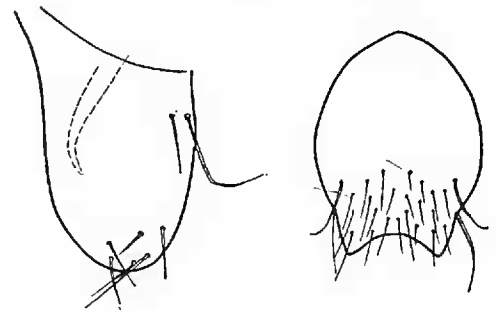
1 lentus



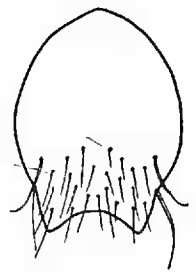
2 parvus



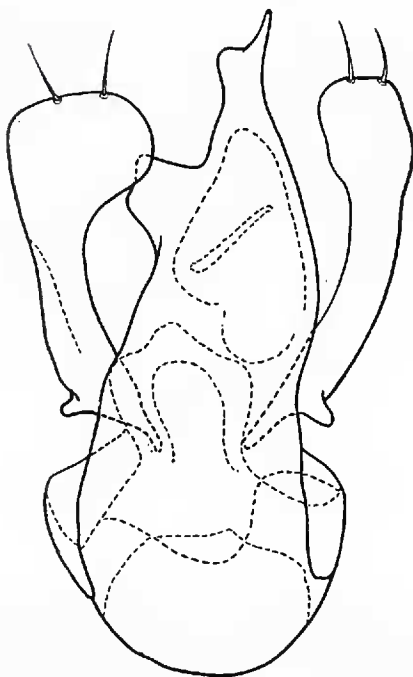
3 ventralis



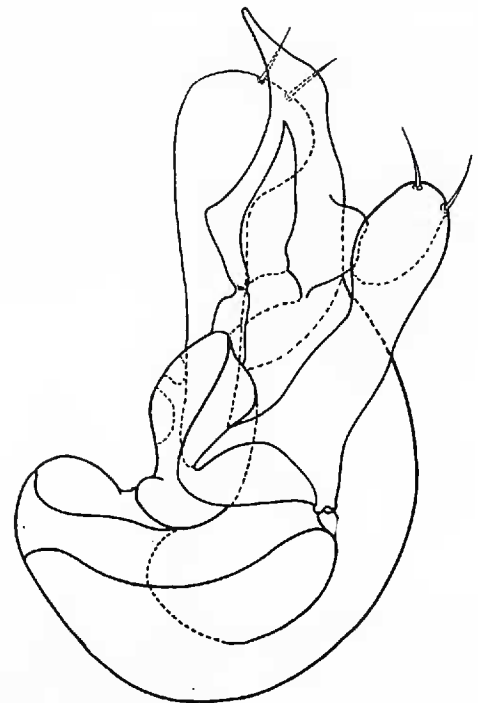
4 lentus



5 lentus



6 fundus



7 fundus

**Megarafonus (Megarafonus) mancus** Schuster and Marsh, n. sp.

*Male*.—Head 0.44 mm. long  $\times$  0.49 mm. wide; pronotum 0.57 mm.  $\times$  0.65 mm.; elytra 0.57 mm.  $\times$  0.81 mm.

As described for *M. lentus* with the exception of the male genitalia (fig. 12).

*Holotype* and two male paratypes were collected at GOLD BEACH, CURRY COUNTY, OREGON on May 11, 1954 by J. Capizzi.

The holotype is deposited in the California Academy of Sciences, the paratype in the California Insect Survey.

The males of this species are distinct on the basis of the genitalia. The configuration of the median lobe, while unique, combines and exaggerates those characteristics of both *M. lentus* and *ventralis*. The extreme apex of the median lobe has broadened considerably and has an arcuately incised inferior flange which is subtended by an elongate projection shorter than but resembling that of *M. lentus*. Females have not been associated with the males.

The type locality is in south coastal Oregon, closely approximating the extreme southern periphery for the entire distributional range of *Megarafonus s. str.*

**Nanorafonus** Schuster and Marsh, new subgenus

Type: *Megarafonus parvus*, Schuster and Marsh, new species.

Although similar in many respects to other members of *Megarafonus, s. str.*, the following species has been placed in a new subgenus mainly on the basis of the male genitalia and the presence of monaxial cervical setae. However, other characters such as its considerably smaller size and toothless condition of the mandibular rami may prove to be equally diagnostic.

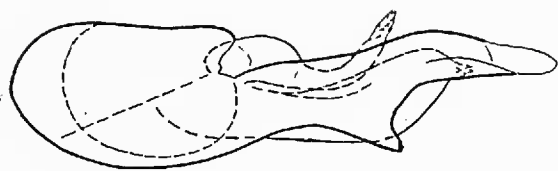
**Megarafonus (Nanorafonus) parvus** Schuster and Marsh, n. sp.

*Head* 0.22 mm. long  $\times$  0.27 mm. wide; pronotum 0.31 mm.  $\times$  0.37 mm.; elytra 0.36 mm.  $\times$  0.46 mm.

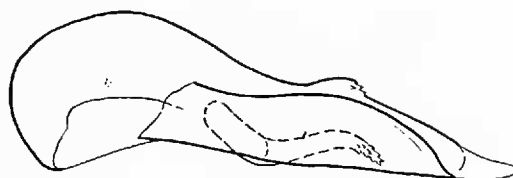
Testaceous; vestiture mostly short but with occasional long, peripheral setae. Head shaped as illustrated (fig. 2); two vertexal foveae not connected to frontal sulcus, frontal sulcus open between antennal tubercles; antennae of eleven segments, the third small, the last three forming an indistinct club; mandibles arcuate, the rami essentially toothless; maxillary palpi of four segments, proportioned as in figure 2; sides and bottom of cervix with a collar of monaxial setae. Pronotum with fovea near each lateral basal angle, two small foveae near base and one small median lovea

## EXPLANATION OF FIGURES

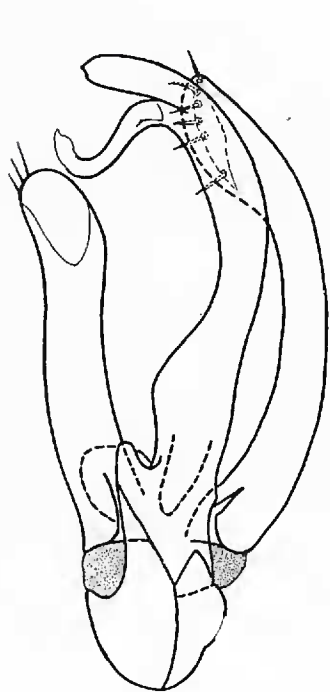
Figs. 8–14, male genitalia (dorsal views excepting fig. 9 which is lateral).



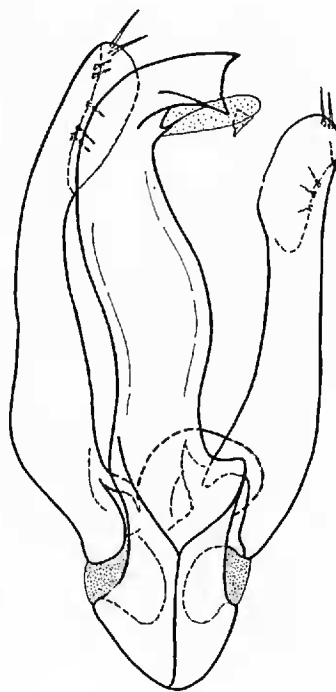
8 parvus



9 parvus



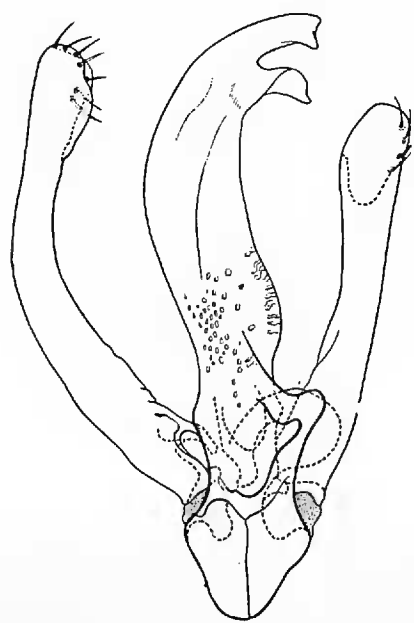
10 lentus



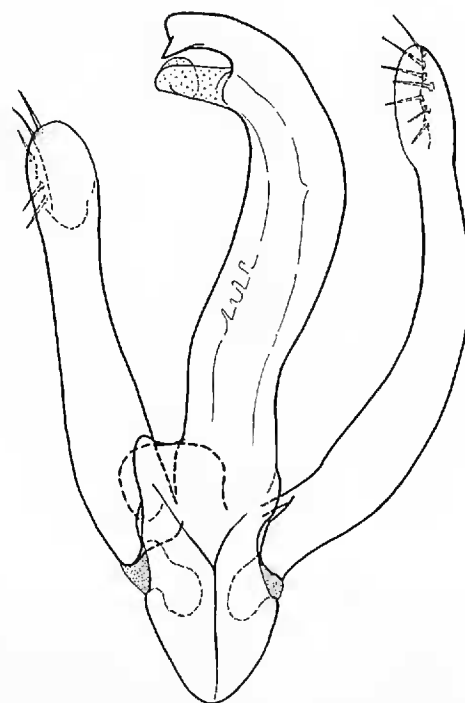
11 ventralis



12 mancus



13 ventralis



14 ventralis

at basal one third. Elytra with fovea at origin of sutural stria and one discal fovea slightly lateral and apical to the former; epipleural foveae and sulcus absent. Abdomen of five visible tergites, the first four with lateral margins, the first three with anterior, transverse pubescent foveae; seven visible sternites, 2, 3, and 4 with transverse pubescent foveae, the sixth emarginate, the seventh an oval penial plate. Legs lacking any particular modification; second tarsal segment partially projecting below elongate third. Genitalia as illustrated (figs 8, 9).

This species is known from a single male, the *holotype*, taken by Berlese funnel from mixed litter of pine, oak, madron, and moss. The sample was collected NEAR STRINGTOWN HILL, NORTH EAST OF OROVILLE, BUTTE COUNTY, CALIFORNIA, February 9, 1956, by R. O. Schuster. The type, a slide mount, is deposited in the California Academy of Sciences.

**Nafonus** Schuster and Marsh, new subgenus

Type: *Megarafonus fundus* Park

This is a monotypic subgenus most closely allied to *Megarafonus*, *s. str.*, from which it differs by having prominent areas of frosted squamose pubescence along the posterior margin of the tempora and filling the frontal and cervical sulci. The base of the male genitalia is one-half the total length and lacks a median longitudinal suture. A complete diagnosis of the type will be found in the original description.

MEGARAFONUS (NAFONUS) FUNDUS Park

*Megarafonus fundus* Park, Bull. Chicago Acad. Sci., Vol. 7, p. 172.

The type was collected by Henry Dybas from Las Vegas, Veracruz, Mexico, at an elevation of 5500 feet. Because the general facies closely approximated that of Casey's *M. ventralis* from Oregon, *M. fundus* was considered congeneric and described as such by Park, thus uniting a Neotropical element with the nearctic. Subsequent dissection of the type and examination of the male genitalia has substantiated Park's original concept in part, but the degree of relationship is not so great that *M. fundus* can still be considered as an integral component of *Megarafonus*, *s. str.*

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FERRIS MEMORIAL ISSUE

The January, 1959 issue of the Pan-Pacific Entomologist is to be dedicated to the Memory of Professor G. F. Ferris and will contain a series of articles relating to his life, teaching and scientific accomplishments.—*Editor*